MATH 1010, Summer 2018 **Dr. S. Cooper**

Quiz 1 Solutions

Name and Student Number: _____

Write your solutions to the following exercises in the space provided. *Show all of your work.* Remember to use good notation and full sentences. *Good Luck!*

1. Find all solutions to each of the following equations. State whether the equation is linear.

   (a) $15x + 2 = 3(4 - x) + 2(1 - 6x)$ [3 pts]

   Solution: This equation is linear. We have:

$$\begin{aligned} 15x + 2 &= 12 - 3x + 2 - 12x \\ 15x + 2 &= 14 - 15x \\ 15x + 15x &= 14 - 2 \\ 30x &= 12 \\ x &= \frac{12}{30} = \frac{2}{5} \end{aligned}$$

   (b) $2(x - 1) + 6 = 4x + 1 - 2(4 + x)$ [3 pts]

   Solution: This equation is not linear and has no solutions. Indeed,

$$\begin{aligned} 2x - 2 + 6 &= 4x + 1 - 8 - 2x \\ 2x + 4 &= 2x - 7 \\ 2x - 2x &= -7 - 4 \\ 0 &= -11 \end{aligned}$$

   (c) $3x + 4 + (1 - 4x) = x - 27 - 2(x - 16)$ [3 pts]

   Solution: This equation is not linear and is satisfied by all real values of x. We have

$$\begin{aligned} 3x + 4 + 1 - 4x &= x - 27 - 2x + 32 \\ -x + 5 &= -x + 5 \\ -x + x &= 5 - 5 \\ 0 &= 0 \end{aligned}$$

   (d) $\dfrac{y}{2} - 3y = 5 - \dfrac{2y}{3}$ [3 pts]

   Solution: This equation is linear. We have

$$\begin{aligned} 6\left(\frac{y}{2}\right) - 6(3y) &= 6(5) - 6\left(\frac{2y}{3}\right) \\ 3y - 18y &= 30 - 4y \\ -15y + 4y &= 30 \\ -11y &= 30 \\ y &= \frac{30}{-11} = -\frac{30}{11} \end{aligned}$$

2. Find all solutions to each of the following inequalities.

(a) $2y + 5 \leq 4$ [2 pts]

Solution:

$$\begin{aligned} 2y &\leq 4 - 5 \\ 2y &\leq -1 \\ y &\leq \frac{-1}{2} = -\frac{1}{2} \end{aligned}$$

(b) $3x + 2 > 4(4 - 3x)$ [2 pts]

Solution:

$$\begin{aligned} 3x + 2 &> 16 - 12x \\ 3x + 12x &> 16 - 2 \\ 15x &> 14 \\ x &> \frac{14}{15} \end{aligned}$$

(c) $2(2r + 1) - 2(3r + 4) \geq 3r + 5 - (4 - r)$ [2 pts]

Solution:

$$\begin{aligned} 4r + 2 - 6r - 8 &\geq 3r + 5 - 4 + r \\ -2r - 6 &\geq 4r + 1 \\ -2r - 4r &\geq 1 + 6 \\ -6r &\geq 7 \\ r &\leq \frac{7}{-6} = -\frac{7}{6} \end{aligned}$$

(d) $2(x + 2) + 1 < 4x + 15 - 2(5 + x)$ [2 pts]

Solution: This inequality has no solutions since it simplifies to a statement that is never true as follows:

$$\begin{aligned} 2x + 4 + 1 &< 4x + 15 - 10 - 2x \\ 2x + 5 &< 2x + 5 \\ 2x - 2x &< 5 - 5 \\ 0 &< 0 \end{aligned}$$